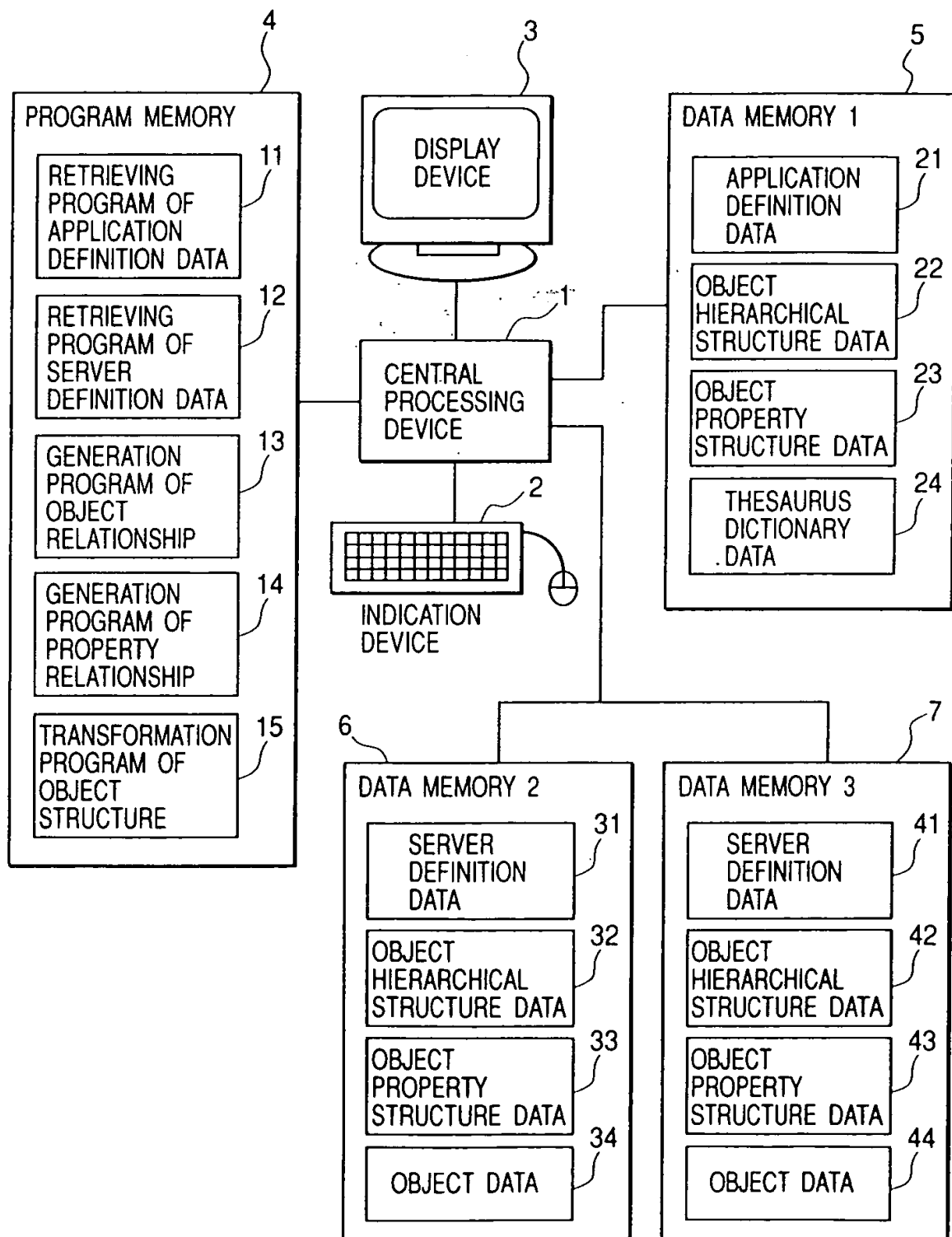


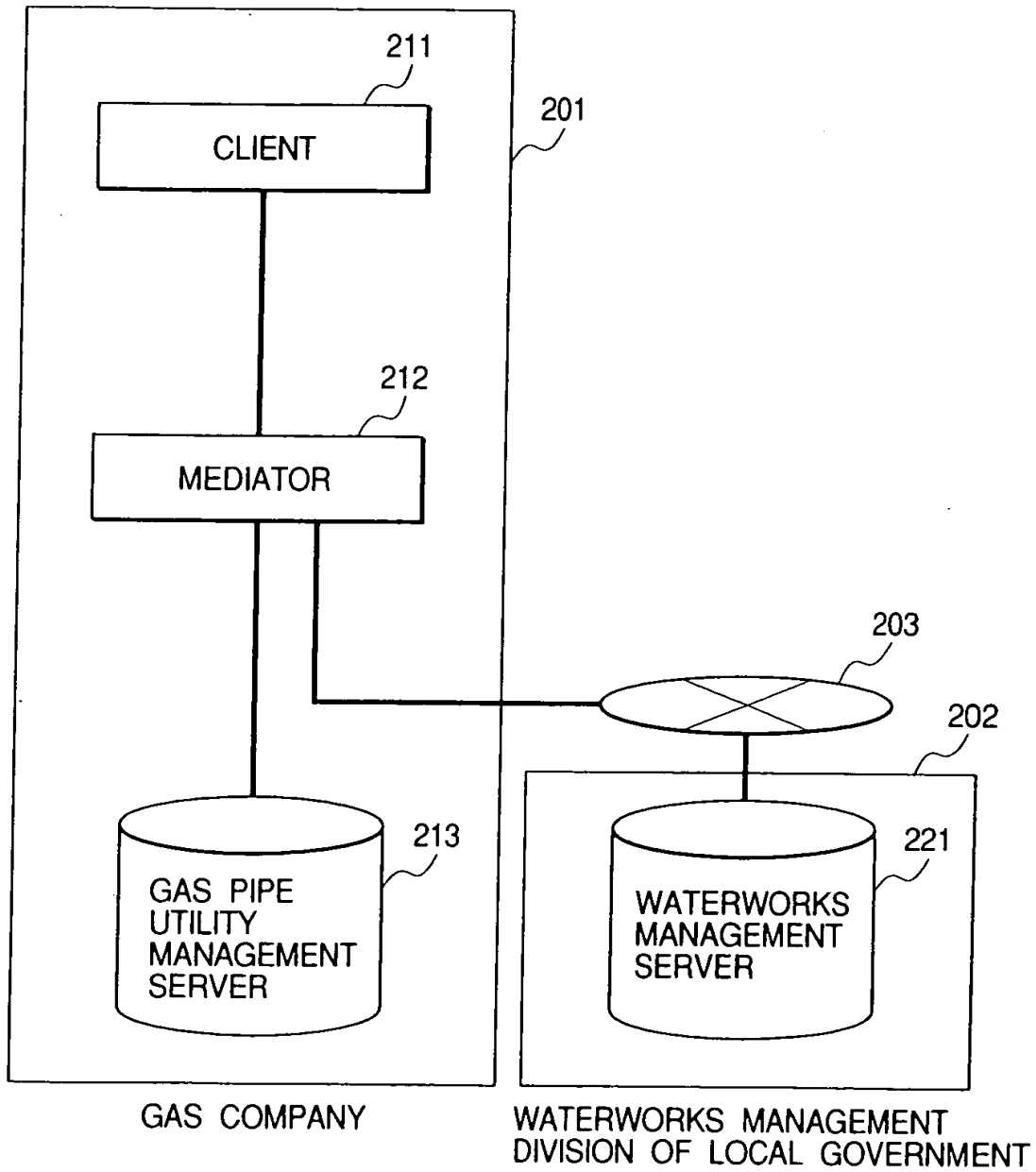
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FIG. 1



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FIG. 2



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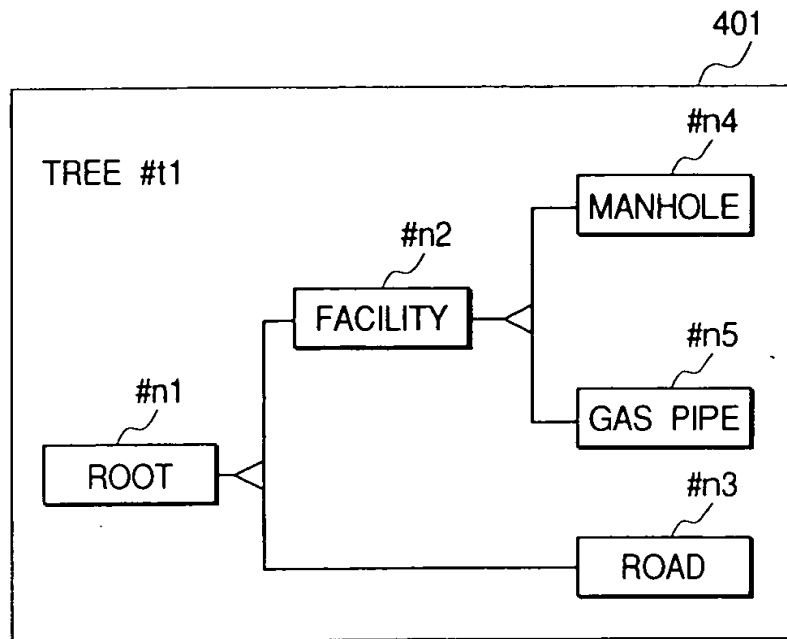
FIG. 3

301

APPLICATION NAME	GAS FACILITY MANAGEMENT	CUSTOMER INFORMATION MANAGEMENT	...
COORDINATE SYSTEM	NATIONAL STANDARD NO. N SYSTEM	NATIONAL STANDARD NO. N SYSTEM	...
AREA OF OPERATION	{CENTER X, CENTER Y, WIDTH, HEIGHT}	{CENTER X', CENTER Y', WIDTH', HEIGHT'}	...
SCALE	1/500	1/2,500	...
UNIT	cm	m	...
UPDATE TIME	MAR. 1999	MAR. 1998	...
TARGET OBJECT	{GAS PIPE, MANHOLE, ROAD}	{BUILDING, ROAD}	

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FIG. 4



DATA STRUCTURE OF TREE #t1

NODE ID	NAME	PARENT NODE ID	CHILD NODE ID
#n1	ROOT	NULL	{#n2, #n3}
#n2	FACILITY	#n1	{#n4, #n5}
#n3	ROAD	#n1	NULL
#n4	MANHOLE	#n2	NULL
#n5	GAS PIPE	#n2	NULL

FIG. 5

UTILITY	PROPERTY NAME	DATA TYPE	501
	IDENTIFIER	INTEGER	
	SET UP DATA	TIME	
	FIGURE DATA	GEOMETRY	
MANHOLE	PROPERTY NAME	DATA TYPE	502
	IDENTIFIER	INTEGER	
	SET UP DATA	TIME	
	CALIBER	INTEGER	
	DEPTH	INTEGER	
	FIGURE DATA	GEOMETRY	
GAS PIPE	PROPERTY NAME	DATA TYPE	503
	IDENTIFIER	INTEGER	
	SET UP DATA	TIME	
	CALIBER	INTEGER	
	LENGTH OF PIPE	INTEGER	
	FIGURE DATA	GEOMETRY	
ROAD	PROPERTY NAME	DATA TYPE	504
	NAME	VARCHAR	
	CLASSIFICATION	STRING	
	WIDTH	INTEGER	
	FIGURE DATA	GEOMETRY	

FIG. 6

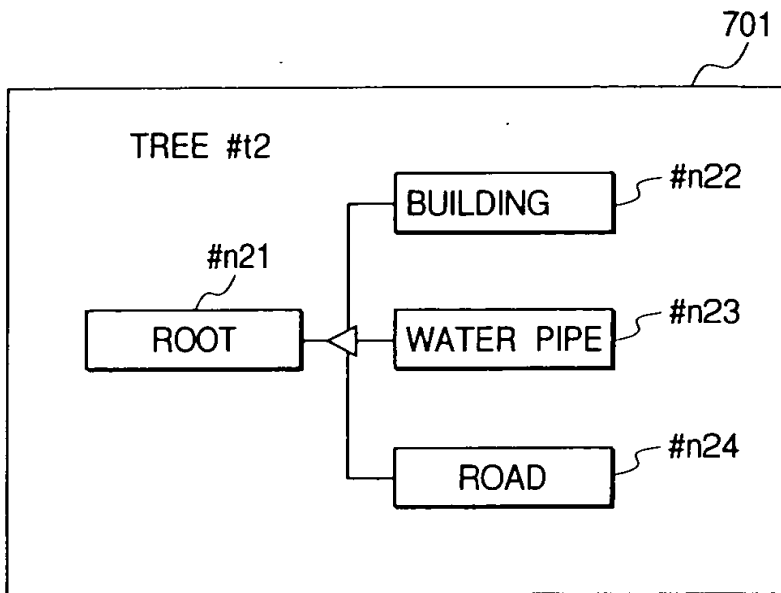
601

SERVER NAME	GAS FACILITY MANAGEMENT SERVER
COORDINATE SYSTEM	NATIONAL STANDARD NO. N SYSTEM
MANAGEMENT AREA	{CENTER X, CENTER Y, WIDTH, HEIGHT}
SCALE	1/500
UPDATE TIME	DEC. 1999
OBJECT NAME	{PIPE, MANHOLE, ROAD}

602

SERVER NAME	WATERWORKS MANAGEMENT SERVER
COORDINATE SYSTEM	NATIONAL STANDARD NO. N SYSTEM
MANAGEMENT AREA	{CENTER X, CENTER Y, WIDTH, HEIGHT}
SCALE	1/1,500
UPDATE TIME	APR. 1999
OBJECT NAME	{BUILDING, WATER PIPE, ROAD}

FIG. 7



DATA STRUCTURE OF TREE #t2

702

NODE ID	NAME	PARENT NODE ID	CHILD NODE ID
#n21	ROOT	NULL	NULL
#n22	BUILDING	#n21	NULL
#n23	WATER PIPE	#n21	NULL
#n23	ROAD	#n21	NULL

FIG. 8

BUILDING	PROPERTY NAME	DATA TYPE
	CUSTOMER NUMBER	INTEGER
	HOUSEHOLDER	STRING
	ADDRESS	STRING
	TELEPHONE NUMBER	INTEGER
	FIGURE DATA	GEOMETRY

801

WATER PIPE	PROPERTY NAME	DATA TYPE
	IDENTIFIER	INTEGER
	UPDATE TIME	TIME
	CALIBER	INTEGER
	LENGTH	INTEGER
	FIGURE DATA	GEOMETRY

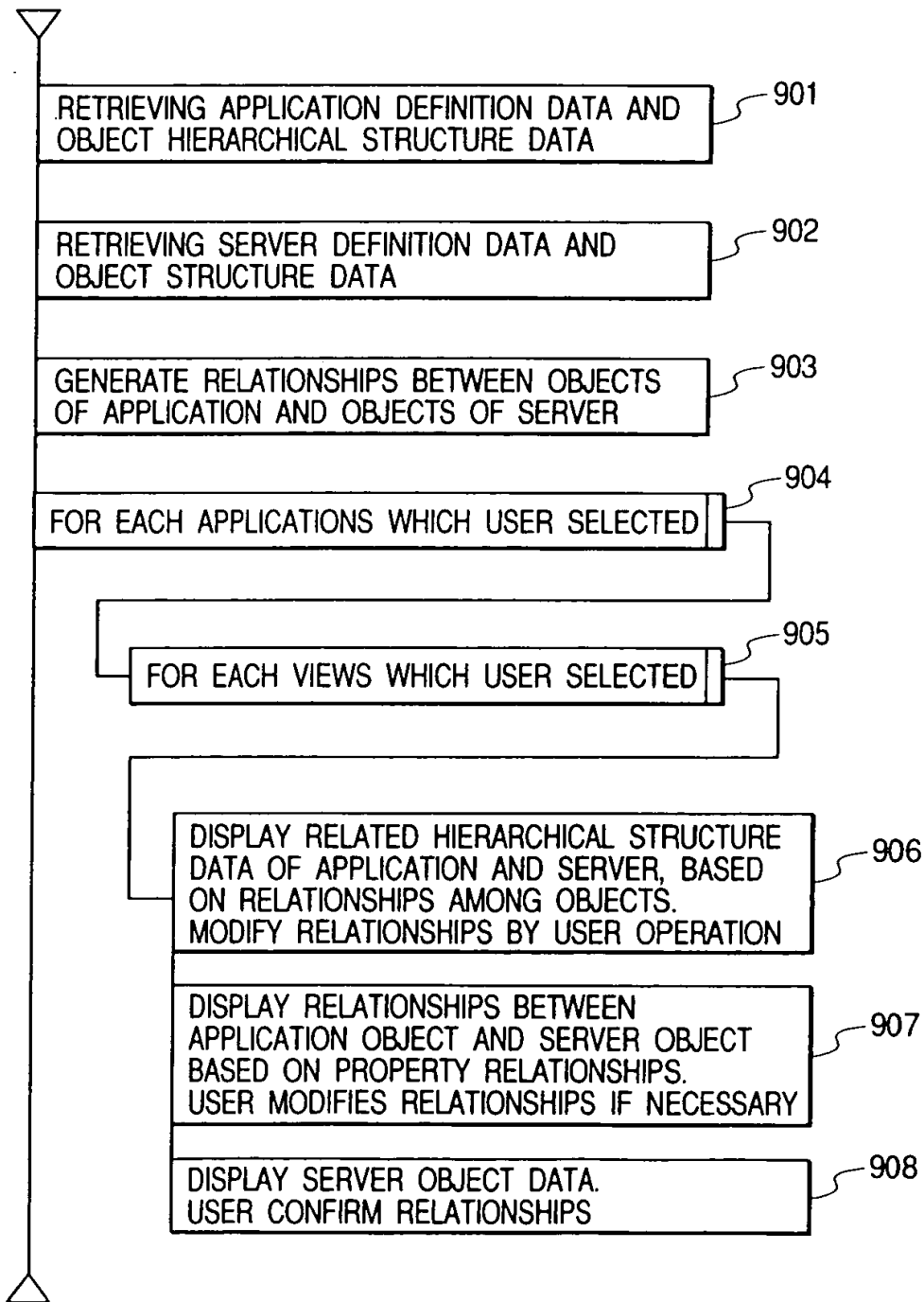
802

ROAD	PROPERTY NAME	DATA TYPE
	NAME	STRING
	CLASSIFICATION	STRING
	WIDTH	INTEGER
	FIGURE DATA	GEOMETRY

803



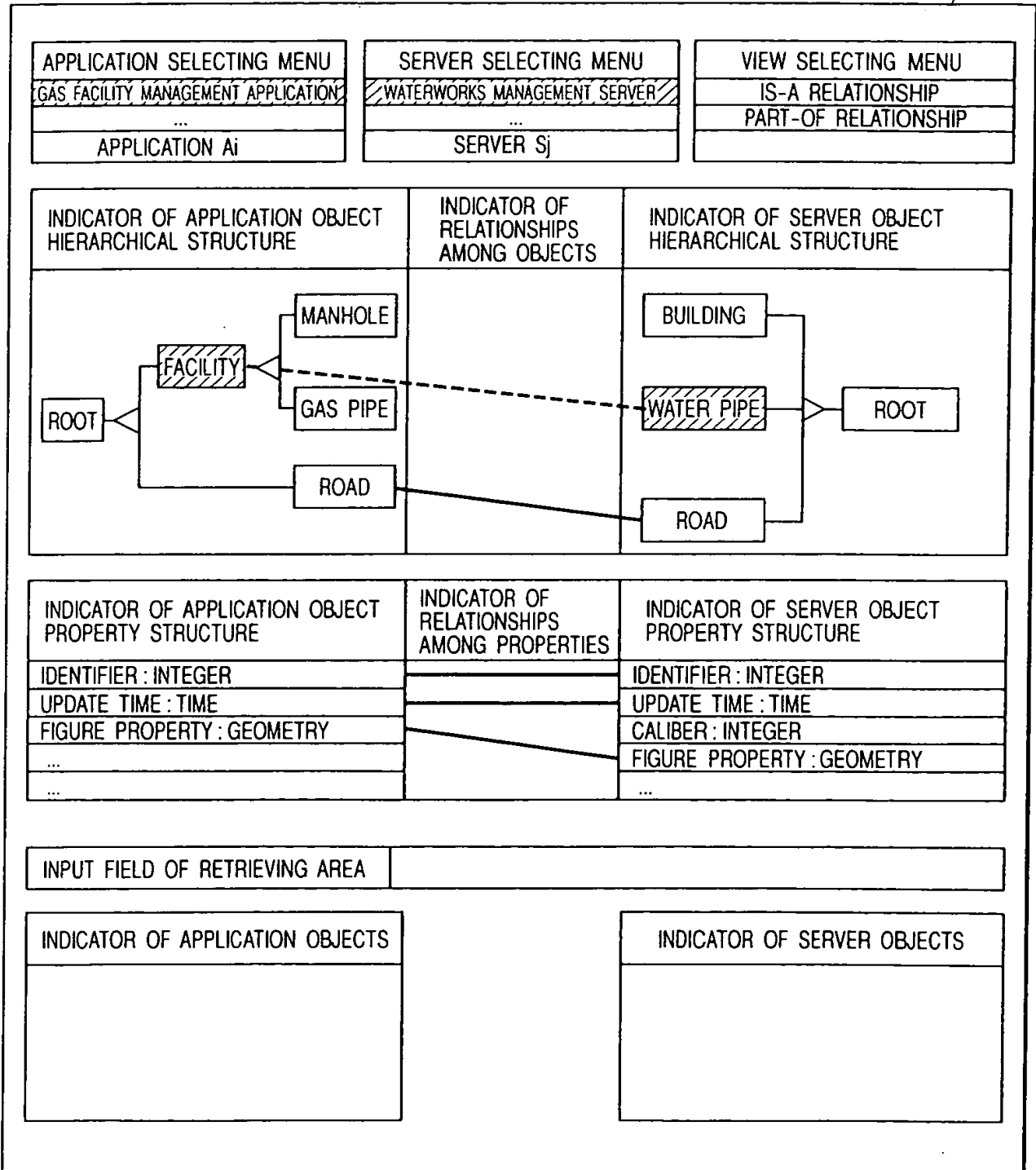
FIG. 9



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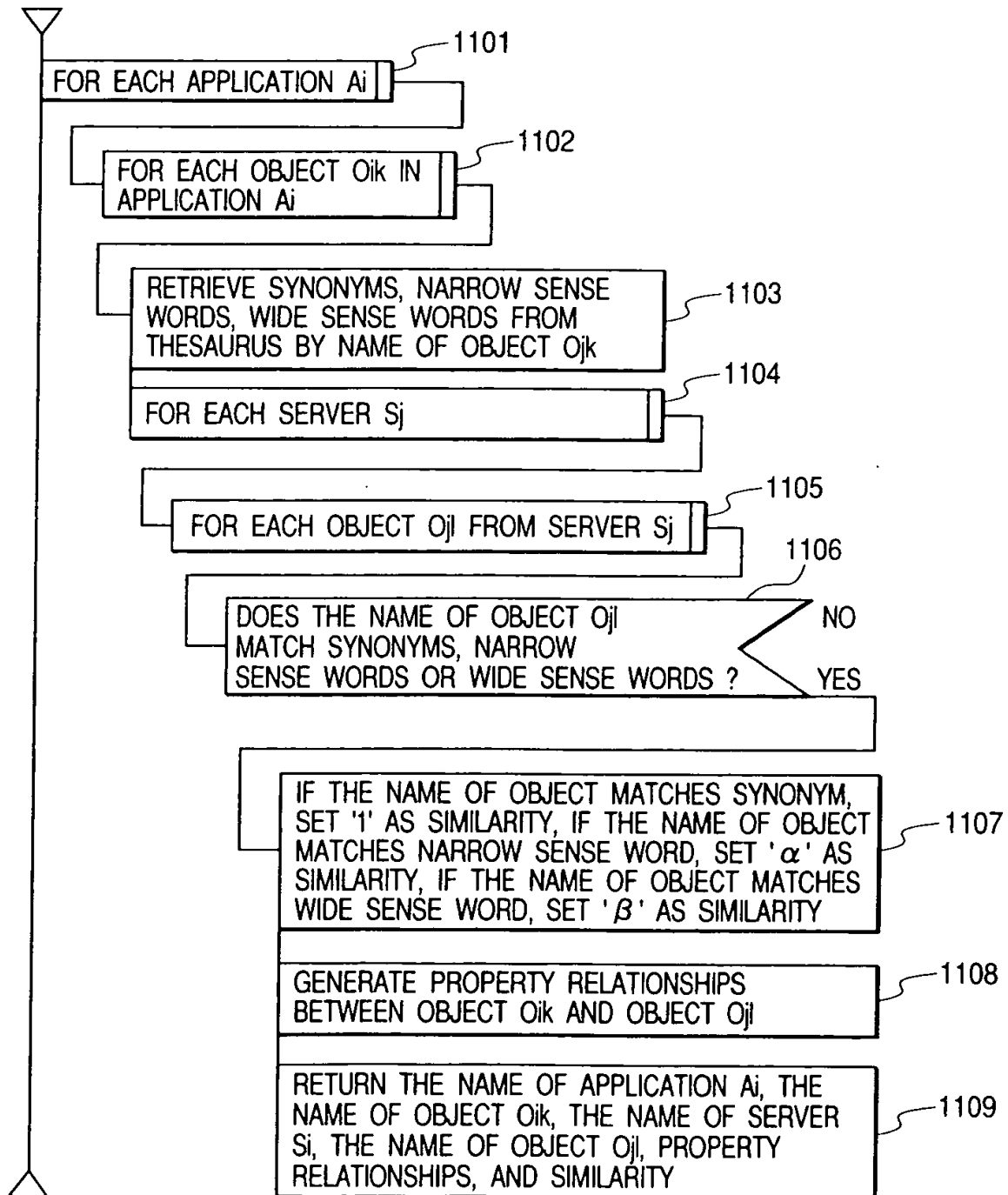
FIG. 10

1001



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FIG. 11



*FIG. 12*

1201

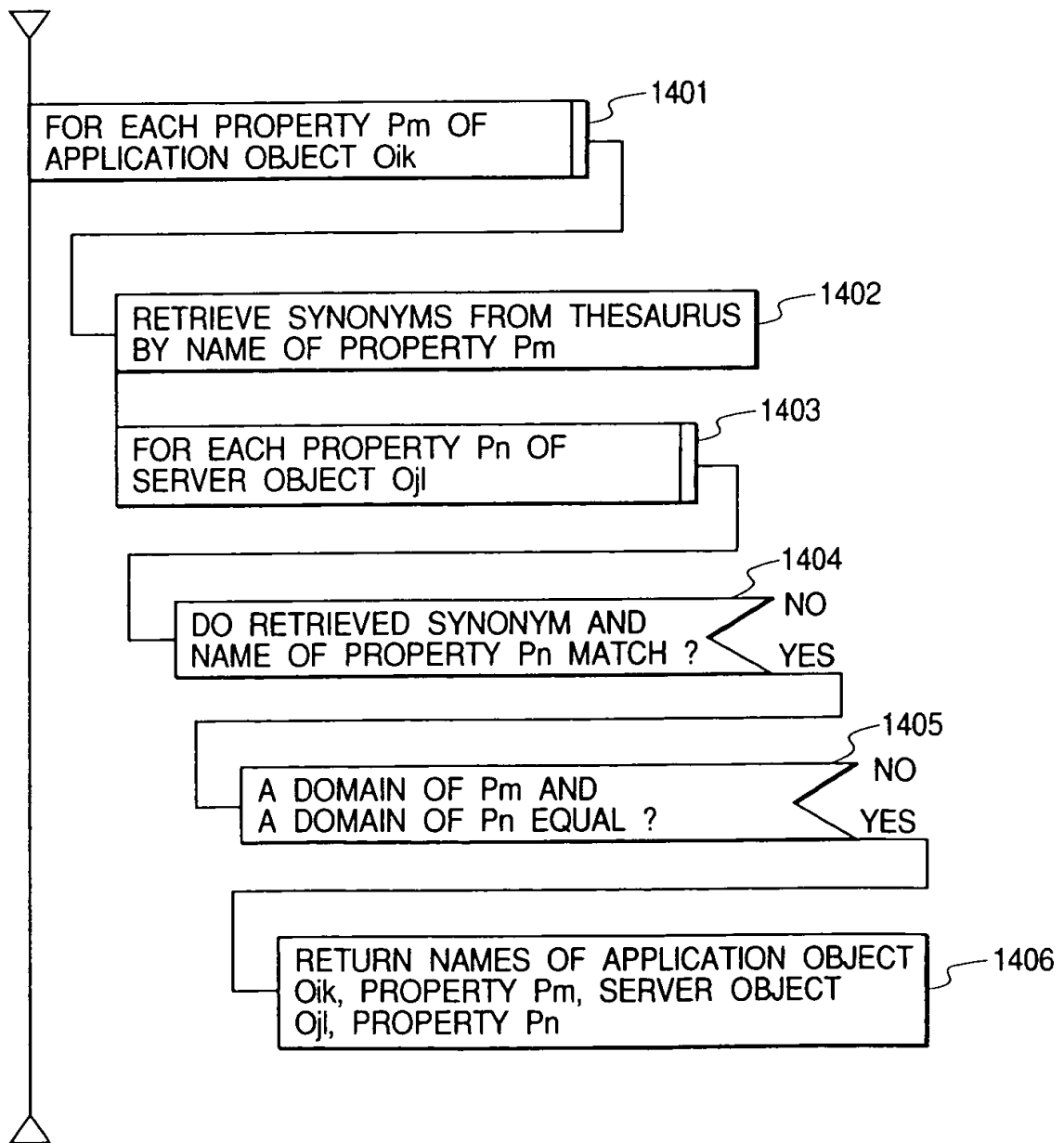
TARGET WORD	SYNONYMS	NARROW SENSE WORDS	WIDE SENSE WORDS
ROAD	{STREET, AVENUE}	{FREEWAY, HIGHWAY,...}	{TRANSPORTATION}
BUILDING	{STRUCTURE,...}	{HOUSE,...}	{CONSTRUCTION}
RAILWAY	{RAILROAD, TRAMWAY...}	{NATIONAL RAILWAY, PRIVATE RAILWAY...}	{TRANSPORTATION}
...	...	...	...

*FIG. 13*

1301

APPLICATION NAME	APPLICATION OBJECT NAME	SERVER NAME	SERVER OBJECT NAME	SIMILARITY
GAS FACILITY MANAGEMENT	ROAD	WATERWORKS MANAGEMENT SERVER	ROAD	1
GAS FACILITY MANAGEMENT	FACILITY	WATERWORKS MANAGEMENT SERVER	WATER PIPE	$\alpha$
CUSTOMER INFORMATION MANAGEMENT	BUILDING	WATERWORKS MANAGEMENT SERVER	BUILDING	1
CUSTOMER INFORMATION MANAGEMENT	ROAD	WATERWORKS MANAGEMENT SERVER	ROAD	1
...	...	...	...	...

FIG. 14

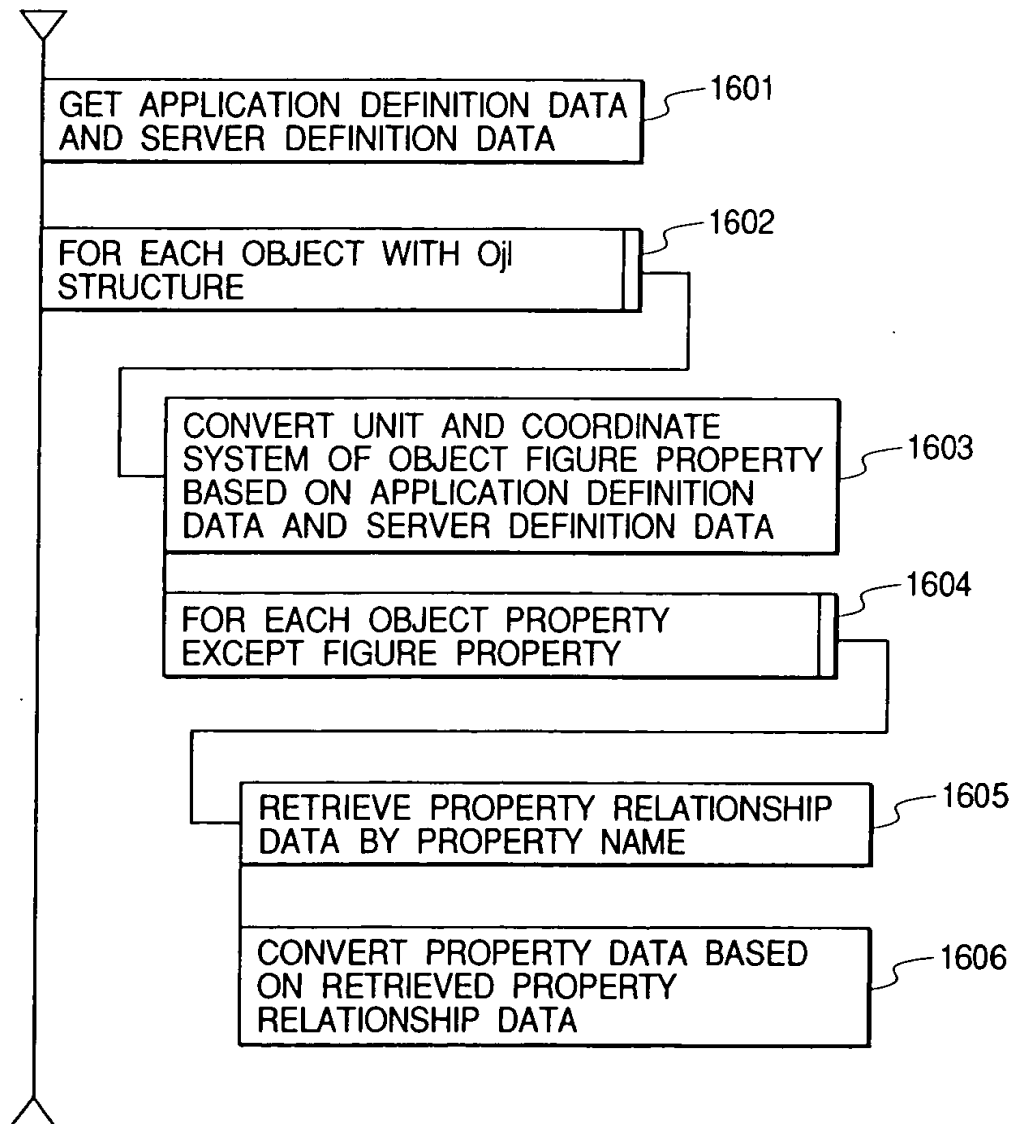


*FIG. 15*

1501

APPLICATION OBJECT NAME	PROPERTY NAME	PROPERTY DATA TYPE	SERVER OBJECT NAME	PROPERTY NAME	PROPERTY DATA TYPE
FACILITY	IDENTIFIER	INTEGER	WATER PIPE	IDENTIFIER	INTEGER
FACILITY	UPDATE TIME	TIME	WATER PIPE	DATA	TIME
FACILITY	FIGURE PROPERTY	GEOMETRY	WATER PIPE	FIGURE PROPERTY	GEOMETRY
ROAD	ROAD NAME	VARCHAR	ROAD	STREET NAME	STRING
...	...	...	...	...	...

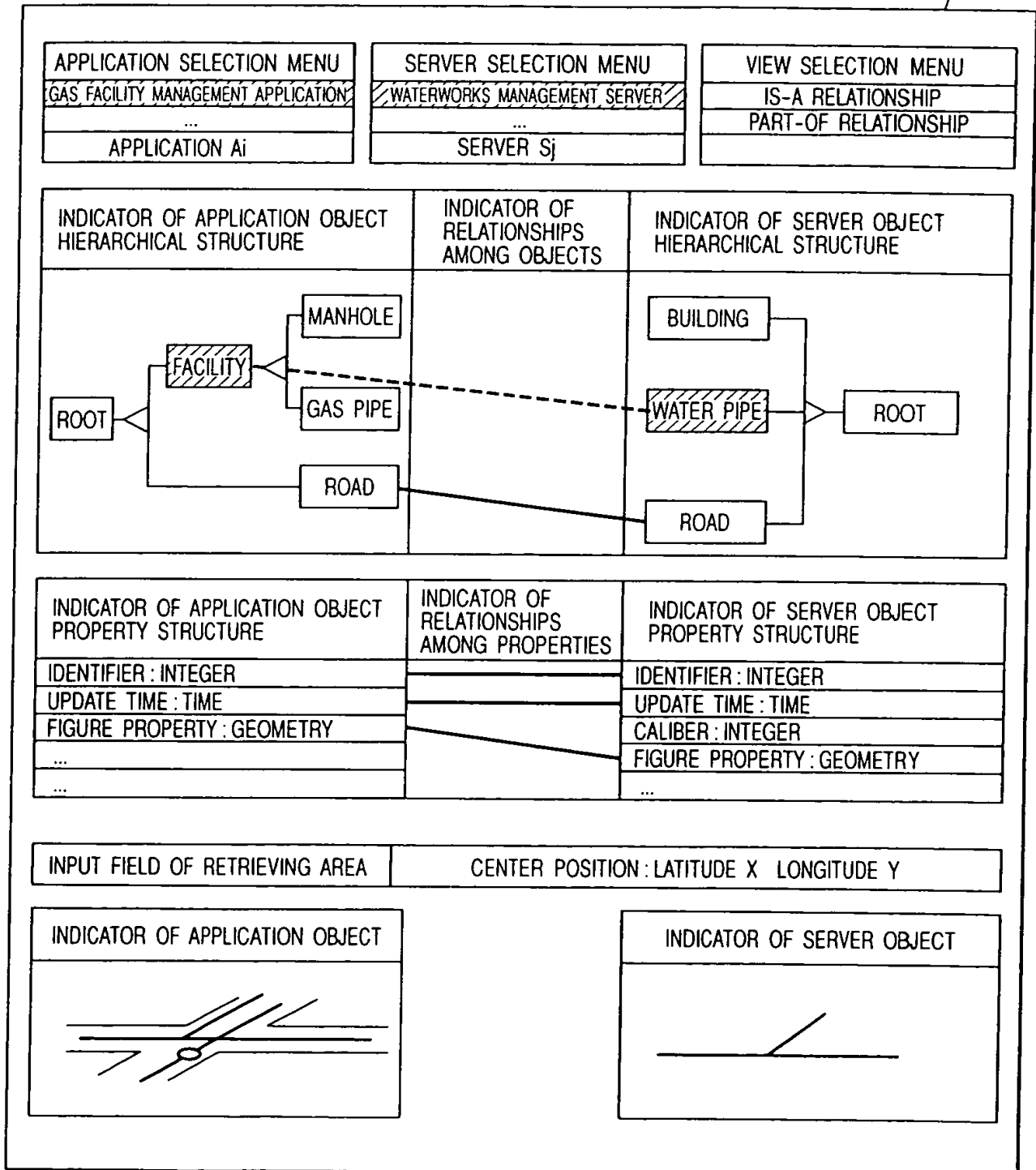
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*FIG. 16*

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FIG. 17

1701



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